Tuesday, April 11, 2017 1:46 PM

p327 Q25

f_b=3.0Hz and f_1=440Hz f_2=? it could be 437 or 443Hz but the questions states that it is approaching so it must be 443Hz
neeeeeyaowwwww (doppler shift)
high pitch approaching low pitch - receding

HL stuff
$f'=f(v+/-u_o)/(v-/+u_s)$
$443 = 440(343+0)/(343-u_s)$

$u_s = -(440 \times 343/443)-343=2.3228$
it is moving at 2.3 m/s towards Ballot.

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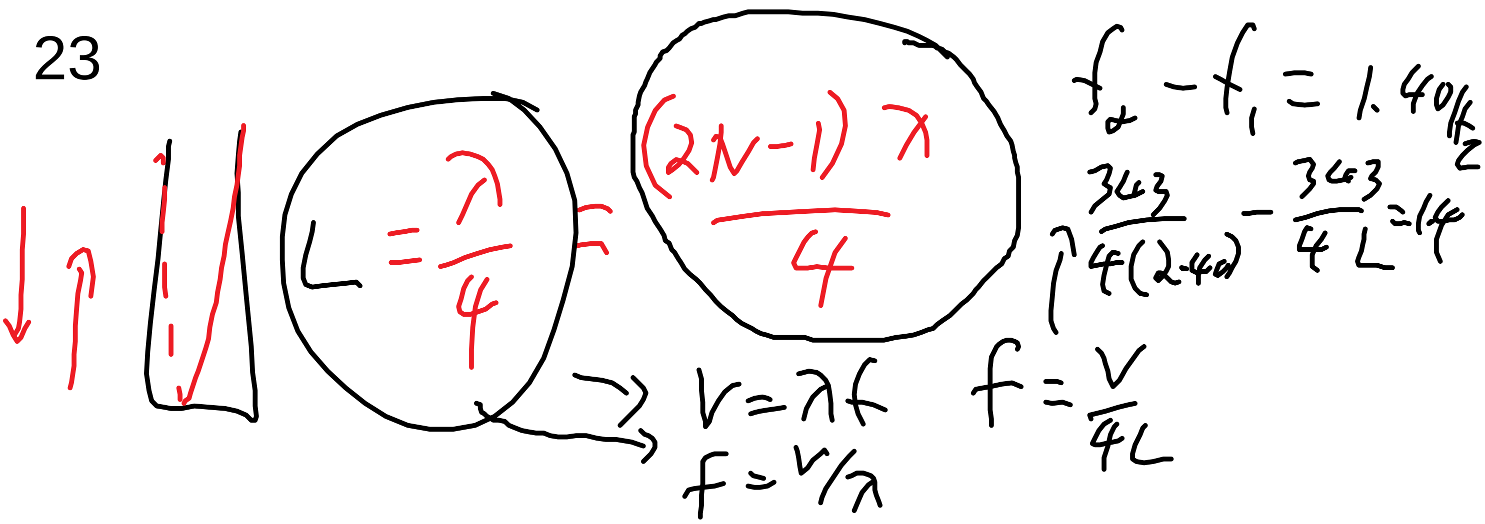


if a 512 Hz tuning fork is hit over a closed tube, you hear resonance at 15.5cm and 48.5cm. What is the a) wavelength b) speed of sound in the room c) end correction?

$L_2 - L_1 = 3\lambda/4 - \lambda/4 = 2\lambda/4 = \lambda/2$

$48.5 - 15.5 = \lambda/2 \quad \lambda = 0.66m$

b) $v = \lambda f = 0.66 \times 512 = 337.92 = 338 m/s$

c) $L_1 + x = \lambda/4$ and $L_2 + x = 3\lambda/4$

$x = 0.01m$

electromagnetic spectrum $c = 3.0 \times 10^8 m/s$

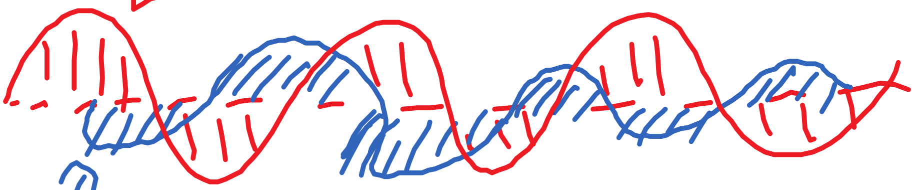
name	wavelength	frequency ranges
Radio	longer than 10m	less than 10^7 Hz
micro	10^{-2} to 10	10^{10} to 10^7
Infra	10^{-7} to 10^{-2}	10^{15} to 10^{10}
visible	7×10^{-7} to 4×10^{-7}	10^{15}
ultraviolet	10^{-7} to 10^{-8}	10^{15} to 10^{16}
x-rays	10^{-8} - ?	10^{16} to ?
gamma	10^{-8} - ?	10^{16}

x-rays are created from accelerated electrons colliding with usually large atoms
gamma rays are created from nuclear reactions

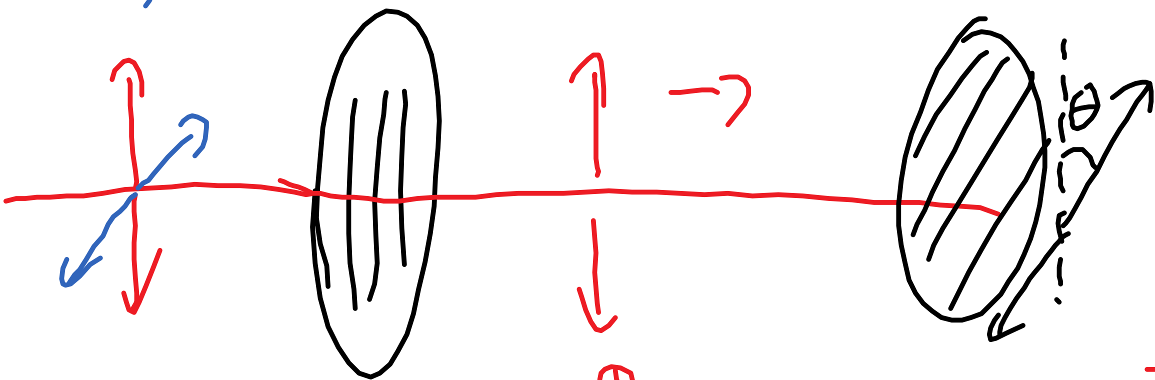
Classically (pre quantum) light was described as electric and magnetic waves created by - changing electric fields create changing magnetic fields that create changing electric fields...

Electric field, E - up + down

Electric field, E - up+down



Magnetic field, B - in/out of page



I_U Polarizer   Polarized light $I_0 = \frac{1}{2} I_u$

unpolarized light

$I = \frac{\text{Power}}{\text{Area}} = A^2$ amplitude

$$I = I_0 \cos^2\theta = \frac{I_u}{2}\cos^2\theta$$

eg. $I=I_o\cos^2\theta = (I_u/2)\cos^2\theta$

$I=I_o\cos^2\theta = (I_u/2)\cos^2\theta$

If light with intensity of 2.0 mW/m^2 goes through 2 polarizers, what is the final intensity of the light if the angle between

the planes of polarization are

a) 0

$I = I_o \cos^2\theta = (I_u/2)\cos^2\theta$

$I = 2.0/2 = 1.0 mW/m^2$

b) 90º

$I = I_o \cos^2\theta = (I_u/2)\cos^2\theta$

$I = (2.0 mW/m^2/2)\cos^2 90 = 0$

a) 45º

$I = I_o \cos^2\theta = (I_u/2)\cos^2\theta$

$= (2.0 mW/m^2/2)\cos^2(45)$

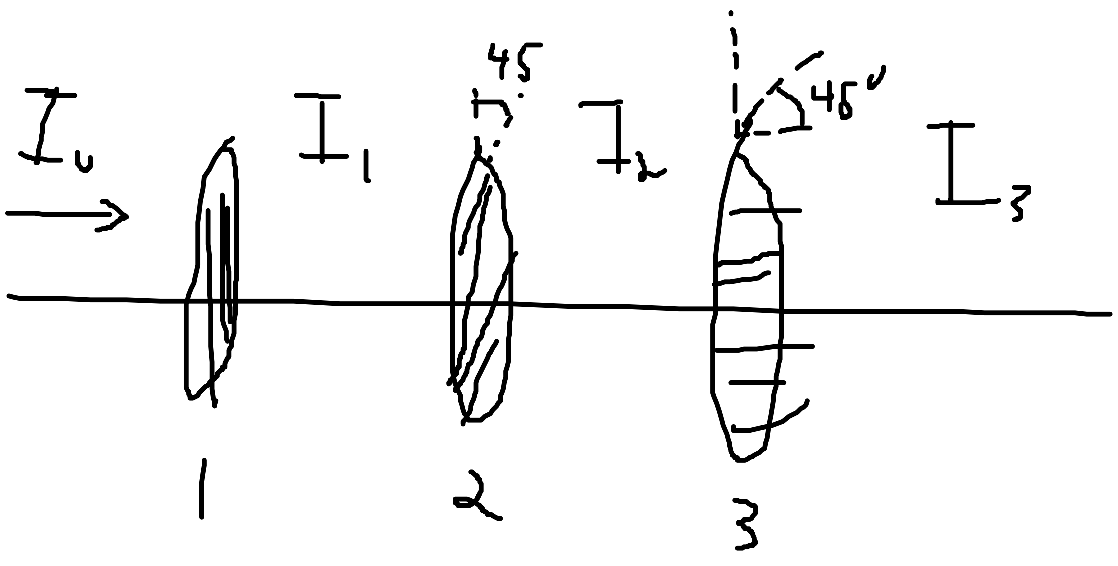
$I = 0.50\ mW/m^2$

b) 30º

$= (2.0 mW/m^2/2)\cos^2(30)$

$= 0.75\ mW/m^2$

What about if there are 3 lenses, each at 45º to each other?



$I_3 = I_2 \cos^2\theta$

$I_2 = (I_u/2)\cos^2\theta$

$I_3 = (I_u/2)(\cos^2\theta_1)(\cos^2\theta_2)$

$I_3 = (2.0 mW/m^2/2)(\cos^2 45)(\cos^2 45)$

$= 1/8$ of $I_u = 0.25\ mW/m^2$
so even though polarizer 1 and polarizer 3 are perpendicular to each other, the middle polarizer rotates the plane of the light so that it still goes through

Homework - do that question and study for the quiz on waves and sound (Ch 14 and 15)